NATURAL HAZARDS MITIGATION PLAN

TOWN OF BARRINGTON

RHODE ISLAND

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HAZARD MITIGATION PLAN

COMMITTEE

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NATURAL HAZARDS MITIGATION PLAN

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Section 1.0 – Introduction

1.1 Definition

Hazard mitigation is an action taken to permanently reduce or eliminate long-term risk to people and their property from the effects of natural hazards.

"Hazard mitigation planning is the process that analyzes a community's risk from natural hazards, coordinates available resources, and implements actions to eliminate risks."
- *Tennessee Emergency Management Agency*

1.2 Geography and Hazards

DESCRIPTION: Barrington is an East Bay residential community. The Town is a commuter suburb with extensive attractive coastal areas, which fifty years ago, were home to many summer bungalows, now supporting year-round residences. The Town of Barrington, on Narragansett Bay, has numerous homes on the bay with additional homes on the Barrington and Palmer-Warren Rivers. Barrington is classified as a medium density developed community, with significant amounts of wetlands and public open space and recreation land. The Hurricane of 1938 (Category 3)[1] was the last 100-year flood (1 percent chance of occurrence in any given year) to hit Barrington. Therefore, much of the presently at-risk population has never experienced a major storm event. Barrington experiences a few nor'easters each winter as well as the Blizzard of 1978. The Town has not experienced problems in dealing with wildfires, dam collapse or earthquakes.

1.3 Goals and Objectives

Barrington adopts this mitigation strategy for the purpose of reducing the risks from natural hazards and protecting lives and property. This mitigation strategy, as approved by the Rhode Island State Hazard Mitigation Committee (RI SHMC)[2], is consistent with state objectives for natural hazard mitigation. The role of the RI SHMC is to review, grade and prioritize all hazard mitigation activities and grants that come through the Rhode Island Emergency Management Agency (RIEMA). This committee is also responsible for reviewing and approving revisions and updates to the state hazard mitigation plan (§409 Plan). The information that is compiled in this mitigation plan will be incorporated into the state hazard mitigation plan.

[1]From the Saffir Simpson Hurricane Disaster – Potential Scale (ranging from 1 to 5 with Category 5 having the highest potential winds.)

[2]The members of the RI SHMC are listed under the acknowledgement section of this document

1.4 Benefits

Mitigation actions help safeguard personal and public safety. For instance, retrofitting bridges can help keep them from being washed out, which means they will be available to fire trucks and ambulance in the event of a storm. Another important benefit of hazard mitigation is that money spent today on preventative measures can significantly reduce the impact of disasters in the future, including the cost of post-disaster cleanup. This municipal hazard mitigation strategy will minimize the economic and social disruption that can result from multiple natural hazards.

Formal adoption and implementation of this strategy will help Barrington gain credit points under the Federal Emergency Management Agency's (FEMA) Community Rating System (CRS). CRS provides discounts on National Flood Insurance Program (NFIP) premiums for property owners in communities that participate in this voluntary program. Points are given to municipalities that form a Local Hazard Mitigation Committee (LHMC). Communities also receive points if they involve the public in the planning process, coordinate with other agencies, assess the hazard and their vulnerability, set goals, draft an action plan (municipal hazard mitigation strategy), and adopt, implement and revise the plan. Non-federally owned open space land in floodplains can also help a municipality gain credit points under the CRS program. In addition, open land enhances the natural and beneficial functions that floodplains serve and helps prevent flood damage.

The adoption of this mitigation strategy will increase the Town's eligibility for federal grants, which include FEMA's pre-disaster Flood Mitigation Assistance Program and its post-disaster Hazard Mitigation Grant Program (see Appendix D). RIEMA gives funding priority to municipalities that have completed a risk assessment and have created well thought-out mitigation projects that include detailed information on cost, responsible party and time frame for completion of projects. Pre-disaster planning will also help post-disaster operations become more efficient. For instance, procedures and necessary permits will be in place, as will clear priorities for mitigation during reconstruction. The state emergency response effort will run more smoothly because of the guidance provided in this strategy.

Section 2.0 – Hazard Risk Assessment

2.1 Risk Overview

Hazard

"Hazard" refers to an extreme natural event that poses a risk to populated areas. Hazard risk assessment determines which areas of the Town may be affected by natural hazards, how likely it is that a given hazard may occur and how intense the hazard might be.

Risk

"Risk" can be defined as "hazard; danger; peril' exposure to loss, injury, or destruction" or "the possibility of suffering harm or loss." Natural hazard risk assessment describes the magnitude, duration and probability of the hazard event. For example, risk assessment estimates potential wind speeds and storm surge for a specific area.

Vulnerability

"Vulnerability" can be defined as "susceptibility to injury or attack." Vulnerability indicates what is likely to be damaged by the identified hazards and how severe the damage might be. For example, if an area is determined to be at risk of flooding, vulnerability estimates could include residential property losses, impacts to the tax base and damages to public infrastructure. The vulnerability assessment is often communicated in terms of the number of lives and the value of property in the high risk areas.

To initiate the risk and vulnerability assessment process, Barrington's Hazard Mitigation Plan Committee ,appointed in April 1999, (which consists of the Town Manager, Police Chief, Fire Chief, Public Works Director, Emergency Management Director and a planner) examined the Town's risk from natural hazards and identified its vulnerabilities to those risks. The committee used the Risk Assessment Matrix (see Table 4) and GIS maps (see Map 1 and Map 2) as tools to help with this process. The risk and vulnerability assessment formed a solid basis on which the committee established mitigation priorities. Sources of information used during the assessment include U.S. Army Corps of Engineers studies, RIEMA reports, municipal records, local knowledge, historical accounts, the Hartford Insurance Loss Control Department and the Town's Comprehensive Plan. The goal is to complete this updated plan for approval by FEMA by September 2004 which will include a public hearing by the summer of 2004.

The first meeting of the LHMT began on April 27, 1999 with a planning session with Joseph Almeida, RIEMA Hazard Mitigation Officer and Lori Watson, URI Coastal Recourses Center. The team met again on July 19, 1999 to develop the outline of the Plan after gathering input and history from local citizens, documents on hazard events and a mitigation approach. An outline was completed and given to the Team Leader Joseph Schall to prepare the final draft.
A first draft was completed and submitted in March 2002 to FEMA for acceptance. It was returned with suggestions for improvements on January 8, 2003.

The Team was reconvened with a new Team Leader on February 24, 2004 to review the critique and prepare a new submission. The second draft was submitted on March 18, 2004. A third draft was again submitted on June 21, 2004 that obtained conditional approval by FEMA on September 21, 2004, pending final public hearing and Town Council approval
Copies of agendas an minutes of meetings are included in the Appendix
Although there was limited public involvement outside members of the Team, Public Hearings will be held early in the planned future revisions. In addidition, this public hearing will include offers to interest groups, business and community leaders.

The Town of Barrington's Comprehensive Plan delineates the vulnerability in Barrington to the hundred year flood and the velocity zone. The hundred year flood plain is that land in Barrington which would be inundated under conditions of a storm frequency of every hundred years or more, while the velocity zone is the coastal area within the floodplain which would be affected by a wave surge during hurricanes. These zones are both defined by the Federal Emergency Management Agency. They designate areas which present a safety hazard to existing and potential development, but also provide for necessary flood water retention.

Because the floodplain follows a contour of a given elevation, it covers virtually the entire shoreline of Barrington. The exceptions are those areas where there are steep slopes along the water's edge, such as Nayatt Point. While the floodplain covers all of the coastal wetlands, and all of the major inland wetlands that are associated with stream systems (which carry storm water), it also goes beyond these areas. One striking example of this is the Bay Spring area in West Barrington; while the wetlands are confined to the land around Allins cove, because of the area's low elevation, most of the neighborhood seaward of the East Bay Bicycle Path would be covered during a hundred year storm.

The velocity zone also covers much of Barrington's shoreline. This wave surge would travel inland the farthest along the three south facing points - - Rumstick, Adams and Tyler Points and across the wetland area to the west of Barrington Beach. It would also cover all of the Walker Farm – Osamequin Park area lying between County Road and Hundred Acre Cove, the Hundred Acre Cove wetland lying east of Nockum Hill, and a major portion of the floodplain along the Palmer River. The velocity zone does cover some areas which are developed, the most prominent examples being along the eastern side of the Adams Point peninsula, and all of Tyler Point. There are other smaller areas of development within the velocity zone, specifically in West Barrington, and in Hampden Meadows on the north side of the Barrington River. With the exception of these areas, however, the velocity zone along Barrington's shoreline is within areas of undeveloped coastal wetlands.

To address the special hazards of flood and velocity zones, a section of the Barrington Zoning Ordinance applies to construction or other development within these areas. The regulations prohibit reduction in flood storage capacity, as well as storage of materials or equipment which could cause damage under flood conditions. All new construction permits on properties within 100 feet of a body of water require Zoning Board review to insure conformance to State and Federal Guidelines that apply within a Flood Zone as well as consideration for proper drainage of the property (as might be affected by construction). Typically there are 15 to 25 building permits issued annually in the Town with 3-4 in the 100 year flood zone. In addition, construction occurring within the velocity zone must take place above mean high tide.

2.2 Natural Hazards

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2.2.1 Hurricanes

A *hurricane* is a *tropical storm* that has rotating winds of at least 73 mph, but rarely exceeding 150 mph. Hurricanes are usually accompanied by rain, thunder and lightning. These severe storms (which are spawned by low-pressure depressions moving over warm, tropical waters) originate in the Atlantic Ocean from June to October. In an average year, approximately six Atlantic tropical storms mature into hurricanes. (Hurricanes that originate in the Pacific Ocean are referred to as *typhoons*.)

As the warming air rises and gains moisture, it begins to spin and gain speed near the calm center, known as the *eye* of the hurricane. Surrounding the eye is a towering wall of moisture laden clouds whirled by strong winds.

At the center of the hurricane, the low pressure allows the surface of the ocean to be drawn up into the eye, forming a mound of water one to three feet higher than the surrounding surface. Driven by winds, this mound of water becomes the *storm surge*; as the storm makes landfall, the storm surge can tower up to twenty feet higher than the normal high tide.

Hurricanes can cause catastrophic damage and potentially large losses of life. In recent years, the death toll from hurricanes has been greatly diminished by timely warnings of approaching storms and by improved programs of public awareness. At the same time, losses from hurricane-related property damage in the United States continue to climb; this is primarily due to an increase in population and construction in coastal communities (such as Barrington).

Hurricane Forecasting

The National Oceanic and Atmospheric Administration's (NOAA) National Hurricane Center in Miami, Florida uses satellite imagery, radar and weather balloons to spot conditions that could trigger a hurricane.

As the storm nears land, NOAA and the Air Force use specially equipped aircraft to fly through the hurricane, measuring wind speed and barometric pressure and gathering other data.

The information gathered is analyzed by computer models that estimate the storm's strength, rate of development, path and estimated storm surge. Based on this information, NOAA issues a tropical storm warning, a hurricane watch, or a hurricane warning. Knowing the significance of these terms is important to both Town officials and residents of Barrington.

A ***tropical storm warning*** may be issued if winds of 39 to 73 mph are expected in an area.

A ***hurricane watch*** is issued for coastal areas when a tropical storm or hurricane conditions threaten within 24 to 36 hours.

A ***hurricane warning*** is issued for specific coastal areas when hurricane-force winds are expected to strike within 24 hours or less.

Usually, warnings allow sufficient time to prepare against hurricane damage and to make decisions for evacuation of personnel, if proper preparation had been taken at the beginning of the hurricane season. Use of the following checklists is essential steps in hurricane preparedness, response and recovery.

Emergency Preparedness: Before the Hurricane

At the beginning of the hurricane season:

- Establish a Natural Hazards Mitigation Plan that takes prevention, emergency response and disaster recovery into consideration. Review and update it as needed for hurricane readiness.
- Designate an Emergency Coordinator and team. Assign responsibility to specific Town employees for advance arrangements to initiate the plan.
- Brace outside storage tanks and outer structures.
- Inspect all battery powered equipment and backup power.
- Inspect sewers and drains.
- Check all drainage pumps.
- Inspect the roof and flashing for serviceability.
- Check the landscaping; prune dead branches.
- Have a supply of plastic or tarpaulins on hand ready to cover water-sensitive equipment.

At the approach of the hurricane:

- Inspect roof drains and piping; are they clear of debris and fully functional?
- Check floor drains and sumps; are they clear of debris and fully functional?
- Check all storm water catch basins and grates to be sure they are clear of litter.
- Be sure that roof flashing is secure.
- Make sure that doors and windows will remain latched.
- Protect windows from flying debris.
- Walk the grounds; move objects inside that could become missiles in high winds.
- Anchor any equipment stored outside that could be moved by high winds.
- Move supplies stored outside to inside storage.
- Assemble supplies for the emergency crews.

- Assemble supplies for emergency repairs.
- Protect vital records against flooding and wind.
- Secure backup records.
- Inspect fire protection equipment.
- Top off fuel in the emergency generators; test run.
- Evacuate non-essential personnel.
- Have remaining personnel take shelter.
- Check the supply and serviceability of sandbags.

Emergency Response: During the Hurricane

- Patrol the community continuously, as long as it is safe to do so.
- Check for any damage to the structure.
- Check for leaks and fire systems impairment.
- Complete any emergency repairs that are possible and safe to perform.
- Shut off any valves where pipes have been broken.
- Watch for flooding. Use sandbags when necessary.
- Watch for reverse winds after the eye of the storm has passed. They will affect different areas and perhaps break trees that had initially been blown in the other direction.

Emergency Recovery: After the Hurricane

- Conduct a roll call of all personnel on the premises.
- Assess the damage.
- Check for safety hazards (downed trees, branches, downed power wires, leaking gas, blocked roof drains, reptiles.)
- Make temporary repairs to protect the structure and supplies.
- Photograph and document any damage.
- Begin salvage operations.

Hurricanes: Summary

Since colonial times, the Town of Barrington has experienced dozens of hurricanes. NOAA places Barrington in the zone of 20-25% probability of experiencing a named coastal storm each year. Strong winds can also create debris problems, especially fallen trees, structural damage and power failure. The Rhode Island building code requires houses to be built for a minimum of 90 mph wind speeds (a Category I Hurricane). Table 2 presents the Hurricane Intensity Scale.

HISTORICAL DAMAGES: HURRICANES/TROPICAL STORMS

Table 1. Significant Rhode Island Hurricanes and Tropical Storms from 1935 to 2001.

Date	Name	Type	Winds (mph)	Property Damage ($million)	Deaths
September 21, 1938	N/A	Westward	95	100	262
September 14, 1944	N/A	Rhode Island	82	2	0
August 31, 1954	Carol	Westward	110	90	19
September 11, 1954	Edna	Eastward	40	0.1	0
August 19, 1955	Diane	Eastward	45	170	0
September 12, 1960	Donna	Westward	58	2.4	0
September 27, 1985	Gloria	Westward	81	19.8	1
August 19, 1991	Bob	Rhode Island	63	115	0

Source: Rhode Island Hurricanes and Tropical Storms: A Fifty-Six Year Summary, National Weather Service Office, Providence, Rhode Island.

The wind speeds recorded are from official weather stations in Rhode Island. Table 1 lists hurricanes and tropical storms impacting Rhode Island over the last sixty-three (63) years, i.e., since the Hurricane of 1938.

Table 2. SAFFIR/SIMPSON HURRICANE INTENSITY SCALE

Hurricane Category	Central Pressure (Millibars)	Wind Speed (MPH)	Damage Potential
1	>980	74-95	Minimal
2	965-979	96-110	Moderate
3	945-964	111-130	Extensive
4	920-944	131-155	Extreme
5	<920	>155	Catastrophic

The greatest threat posed from a hurricane is from the heavy rainfall and from flooding caused by the storm surge. However, hurricane-force winds and flying debris can cause extensive damage until they dissipate. Hurricanes can also spawn tornadoes that are extremely dangerous and that contribute to the overall damage

2.2.2 Winter Weather

Snow and Ice (severe winter storms)

Winter storms often spawn other natural hazards, such as extreme winds, coastal erosion and flooding. The weight of accumulated snow or ice can damage infrastructure and possibly cause buildings to collapse. Utility and power lines can break from the weight of snow or ice, coupled with strong winds. This could put residents at risk of losing heat, electricity and water (if using well water). Flat-roofed buildings face a more serious structural risk from heavy snowfall. Snow melting poses problems as well, such as road flooding in low-lying areas.

Severe winter weather can occur in many forms. Rain, sleet, ice, snow, hail, blizzards, or any combination of these is possible. Often, a change of only a few degrees in temperature can make the difference between a rainy winter day and a severe winter storm. Severe winter storms can be local, or they can affect major areas of the country; they may vary with intensity, depending on location. Severe winter storms and their residual effects can hamper local or distant services critical to your operation. Storms can also occur back to back in quick succession, providing little time to recover from one storm before the next one strikes. Before winter storm strikes, the Town should consider the following:

Emergency Preparedness: Before Snow Season Begins

Have a winter preparedness plan ready before snow season begins.

- Review and update the winter preparedness plan as needed for winter storm readiness.
- Designate an Emergency Coordinator/Team. Assign responsibility to specific employees for advance arrangements to initiate the plan.
- Establish contingency plans for staffing, fuel, equipment, fire protection, strategic shutdown, continued business operations, etc.
- Establish policies for early closure, early staff release, delayed opening, strategic or emergency shutdowns, etc. Make sure all employees are aware of the policies, and make sure all employees know where they can obtain updated company information.
- Establish means for communicating with employees, contractors, emergency agencies, etc.
- Designate an individual to monitor the weather forecast.
- Alert maintenance staff when cold or snowy weather is expected.
- Inspect buildings, equipment, etc.; be sure to include idle facilities and equipment.
- Schedule annual maintenance and repair of building and heating systems well before winter.
- Maintain buildings at 40º F (4º C) or above.

- Designate an individual to monitor indoor building temperatures every few hours. Install thermometers, especially in hard-to-heat areas.
- Insulate piping, and consider installing heat tracing lines on critical piping. Be sure piping systems in concealed spaces are kept warm.
- Check that buildings have adequate insulation and that windows, doors, skylights, louvers, ducts, dampers and vents are property closed or sealed.

- Inspect, test and repair heating equipment, boilers, combustion controls and safety devices. Remember to test back-up equipment.
- Identify equipment containing water or through which water flows that should be drained before cold weather (or in the event that the building's heating system shuts down.)
- Check valves, drains and vents to be sure that moving parts are in working order and that openings are unobstructed.
- Install snow fences and marker poles at hydrants and at fire protection control valves.
- Block waling areas under roof overhangs to prevent falling snow from creating a hazard.

Pay special attention to fire protection systems and equipment:

- Check all areas of the building to be certain that sufficient heat (40ºF, 4ºC or above) is maintained to prevent sprinkler systems from freezing. *Don't* use electrical heat tape on dry pipe valves as a substitute for permanent heating.
- Be sure that fire extinguishers are protected from cold or are of the type that are not vulnerable to cold (e.g., antifreeze or ABC types)
- Check anti-freeze solution strength of sprinkler systems annually.

Prepare equipment needed to respond to winter conditions:

- Acquire, prepare, inspect, repair, and/or maintain snow removal equipment and machinery (see below).
- List suppliers (with their telephone numbers) for portable boilers, heating units and/or electric generators.
- Top off fuel in emergency generators; test run generators.
- Check fuel supplies and fueling equipment.

Prepare or acquire other supplies:

- Tarpaulins
- Space heaters
- Steam hoses (for thawing frozen lines)
- Antifreeze
- Warm clothing, especially hand, head and foot protection
- Food, water
- Cots, blankets

Plan for snow removal:

Acquire, prepare, inspect, repair and maintain snow removal equipment:

- Shovels
- Ice scrapers
- Wheelbarrows
- Sand/salt spreaders
- Snowblowers
- Ice chippers
- Plows

Obtain sufficient fuel supplies.

- Be sure the snow removal plan includes roofs, skylights, canopies and overhangs.
- Screen/select staff carefully for heavy physical activity like shoveling.
- Have a place where workers can get warmed up and fed and where they can rest.

When snow removal is to be done by contractors:

- Verify that a snow removal contractor is in place for the season.
- Obtain a Certificate of Insurance to verify the limits of general liability coverage.
- Where possible, have your company named as an additional insured under the contractor's general liability policy.
- Review the contract to verify that a hold harmless agreement is in effect.
- Determine exactly what services will be provided (e.g., plowing, sidewalks/entries, roofs, etc.)
- Determine when the contractor will respond (i.e. after a certain amount of snow has fallen, at a predetermined time of day, etc.)
- Determine what records they maintain (e.g., weather conditions for the day, time of plowing, depth of snow plowed, unusual occurrences, time work completed, etc.)

Emergency Response: During A Winter Storm

General preparations:

- Depending on the severity of the storm, close early or delay opening to keep nonessential personnel out of the facility.
- Provide updated information to all employees, both on premises and off.
- Check all areas to be sure there is sufficient heat to prevent freezing.
- Forego planned heating plant or boiler inspections until after the storm has ended.
- Place signs at the exits of the building, in elevators, and/or on each floor to alert employees or residents of weather conditions. Keep a log of the days that the signs are posted.

Prepare entry areas:

- Place "walk-off" mats at entries during periods of rain or snow.

- Check the condition of the mats to be sure that the edges are flat and do not create a trip hazard.
- Check the mats regularly to see if they need to be replaced (due to the amount of water absorbed in them).

Snow removal tips:

- Clear snow from:

- Hydrants, control valves and hose houses
- Sidewalks, ramps and entryways
- Driveways
- Roads
- Heating and ventilation equipment and ducts
- Roofs
- Overhangs
- Canopies

- Determine the best location for placement of snow that is moved; be sure to communicate this information to the people who will actually be moving the snow. Place snow:

- Away from the main entry and walkways
- Away from hydrants, fire department connections and outside sprinkler control valves (e.g., PIV post indicator valves)
- Where it will not drain onto the parking lot, street or sidewalk and re-freeze
- In designated parking spaces set aside for that purpose.
- Maintain communications with on-site snow removal crews.
- Provide a warm area with food, water and supplies, and perhaps cots and blankets.

Emergency Recovery: After A Winter Storm

- Inspect buildings, equipment and grounds for damage.
- Document storm damage (photos, notes, emergency reports, etc.)
- Initiate emergency repairs to prevent further damage.
- Clear snow from fire access routes, exterior valves and hydrants
- Complete snow removal from sidewalks, stairs, driveways, roofs, etc.
- Inspect and repair equipment; refuel.
- Prepare for the next storm.

Preventing Roof Collapses Due to Snow

Prepare roofs for winter storms

- Understand the causes of roof collapse: heavy snowfall, drifted or wet snow, and ponding water as snow melts. Rain on snow is very hazardous; snow absorbs rain, becoming dense and heavy.
- Review roof design to determine if it can support the weight of snow, ice and water.
- Inspect roofs, looking for weaknesses.
- Reinforce roofs as needed, particularly where drifting (and therefore increased weight) is likely.
- Inspect gutters, drains, downspouts and scuppers, making sure that they are clear and in good condition. Consider installing listed or approved heat tracing in downspouts and gutters to keep them clear of ice.
- Determine a safe snow depth for each roof. Plan to begin snow removal when accumulated snow reaches half this depth.
- Have a snow removal plan. Be sure the plan includes roofs, skylights, canopies and overhangs. Specify who is responsible for monitoring, snow removal, etc.

During storm conditions:

- Monitor weather and roof conditions continuously.
- On the roof, check for snow depth, drifting, puddles, ponding and/or ice accumulation.
- Inspect roofs for leaks or structural deficiencies that may develop as snow and ice accumulate.
- Keep gutters, drains, downspouts and scuppers clear of leaves, snow, ice, silt or other debris.
- Connect roof overhang heating wires.

Carefully plan snow removal from roofs:

- Do no send workers onto the roof if it is in danger of collapse.
- Remove snow and ice from roofs, skylights, canopies and overhangs as soon as possible.

- Remove only as much snow as needed; too much digging and scraping could damage the roof.
- Pay special attention to removing snow in areas where lower and higher roof portions join, where drifting and blowing snow can accumulate.
- Clear paths to drains and clear the area around each drain.
- On pitched roofs that do not have drains, open paths to the eaves to allow drainage.
- Do not use tools that may damage the roof, such as ice choppers.
- Set snowblower blades high enough so that they won't damage the roof.

If a roof collapse occurs or is imminent:

- Evacuate the building.
- Shut off water, gas, electricity, processing systems, etc., but keep *on* as much of the automatic sprinkler system as possible.
- Be extra careful to avoid fire hazards in areas where sprinklers have been shut off.

- Move equipment and stored goods or cover with tarpaulins to protect from the elements.
- Shore up building and roof sections if this can be done safely.

After the storm:

- Inspect, document and repair damage to roofs, skylights, canopies and overhangs.
- Prepare for the next storm. Replenish supplies, inspect and maintain equipment.
- Evaluate the success of the snow removal operation; make changes as needed.

Sidewalks

- Develop a written procedure for sidewalk maintenance.
- Determine what will be done (e.g., shovel, place ice-melt, etc.)
- Determine who is responsible for completing each task.
- Determine where the removed snow and ice will be placed.
- Determine who will check walking surfaces and when.
- Document the times of the shoveling, visual checks and conditions.

If an Incident Occurs

- Assist the person; provide comfort.
- Do not admit liability.
- Follow established incident procedures.
- Include all statements in an incident report.
- As soon as possible document the condition of the location. If possible, take an instant picture and indicate the date/time of the photo and by whom it was taken.
- Conduct an accident investigation.

Summary

Winter storms are a normal occurrence in Barrington, with snow fall ranging from a few inches to blizzard conditions as seen in the winter of 1978. This memorable storm virtually brought life to a standstill for a full week in all Rhode Island with widespread power outages. Year to year predictions are impossible, but annual preparedness of all Town Agencies is a high priority.

2.2.3 Earthquakes

Definition:

An *earthquake* is a shaking of the earth that is volcanic or tectonic in origin. Though earthquakes do not occur frequently, they can be very disruptive because they affect very large areas and occur with no warning.

Earthquakes vary in duration. The shaking can be a single event of a few seconds or it may be a series of events of varying duration. The series can occur over several hours, days, weeks or even months.

Severe tremors that occur after the main seismic event can be particularly damaging since structures may have already been weakened during the initial shake. These tremors also have a devastating effect on may people who have already gone through previous shaking.

The energy expended during an earthquake will vary depending on the location. It will affect structures differently depending on soil type, geological formation, the distance from the epicenter, the type of structure and other factors.

Most Americans think that earthquakes are limited to the West Coast. However, they occur in other areas of the country. Some areas are more likely to experience earthquakes than others. The earthquake risk in the Town of Barrington is considered minimal.

USGS (United States Geological Services) rates all of Rhode Island as a low probability area (<2% g peak acceleration) for significant earthquake occurrence. There are occasional tremors felt in this area, but recoded events have had an effect of no more than vibrating ground or cracked plaster in isolated homes. However, buildings in the Town at most risk are old masonry structures such as the Town Hall and Library/Senior Center.

Earthquakes occur without warning. Since it is not possible to predict an earthquake, all preparations must be done with the anticipation that an event may occur at any time.

Emergency Preparedness: Before the Earthquake

- Review and update plan as needed for earthquake readiness.
- Designate an Emergency Coordinator and team. Assign responsibility to specific employees for advance arrangements to initiate the plan.
- Develop a contingency plan to allow for continued Town government operations.
- Conduct a hazard assessment and safety appraisal of government and school facilities. Upgrade deficient areas.
- Upgrade structures to current earthquake codes.
- Inspect tanks, stacks, signs and chimneys for deterioration and bracing. Repair and strengthen as necessary.
- Identify and designate safe shelter areas in the structures.
- Identify and designate at least two evacuation routes for all areas.
- Brace all tall shelves and cabinets, tall machinery and equipment or any top-heavy objects that could topple.
- Brace and support overhead-mounted fixtures, suspended ceilings, piping, heaters and other overhead-mounted devices.

- Provide flexible fuel supply connectors.
- Bolt down and secure fuel-fired appliances.
- Provide isolation valves for piping systems.
- Provide adequate support for mainframe computers.
- Provide alternate energy sources for vital equipment and services.
- Provide auxiliary equipment and energy supplies for critical services such as communications and lighting.
- Plan for continuous security.
- Plan for customer and client awareness and communications.
- Provide an alert and warning system for all personnel on the premises.

Emergency Response: During the Earthquake

Most earthquakes last only a few seconds to a couple of minutes. There's not much time to do anything other than sound an alarm to warn all personnel to seek cover in the designated safe

Emergency Recovery: After the Earthquake

It is important to know that aftershocks can occur after the main event. They can be as strong as the main event, but they usually diminish in strength. However, *extreme caution must be exercised,* since structures may have been weakened during the initial shaking.

- Be prepared for aftershocks.
- Shut down equipment and evacuate the building.
- Stay out of the building until the aftershocks have ceased and the building has been inspected and declared safe.
- Conduct a roll call of all personnel on site (including visitors).
- Inspect the structure.
- Shut off all leaking utilities.
- Inspect all utilities and turn off those that are damaged.
- Do not use open flame in enclosed areas where flammable gases may be present.
- Brace, relocate or remove any hazards that could fall during aftershocks.
- Document the damage.
- Communicate with employees and customers to keep them apprised of the damage and organizational progress.

Begin salvage operations.

2.2.4 Lightning

Definition:

Lightning is the atmospheric discharge of electrical energy from one charged area to another area of different charge. This current flow can occur between cloud and cloud, or between the earth

and a cloud. During the initial lightning flash, current flows exceed 140,000 amperes 99 percent of the time with multiple strokes of reducing current flow intensity.

Lightning causes property damage directly from the hit and through induced electrical surges; it can also start fires. Parts of a structure most likely to be struck are chimneys, flagpoles, towers, deck rails or other objects that project above the surrounding area. On buildings which have flat roofs, the roof edge is most likely to be struck. Lightning is also a very serious personal threat.

Lightning protection is accomplished by providing the means by which a lightning strike can enter or leave the earth (for example, through a lightning rod) without causing property damage or loss of life. The path must be of low impedance so that excessive heat is not generated; this heat can start fires.

Emergency Preparedness: Before Lightning Storms

- Establish a plan that takes prevention, emergency response and disaster recovery into consideration. Review and update it as needed for lightning readiness.
- Designate an Emergency Coordinator and an EPP Team. Assign responsibility to specific employees for advance arrangements to initiate the plan.
- When a severe storm is approaching, listen to the radio or TV for updated weather information. An AM radio is sensitive to electrical disturbances that are detected by background static. This static will alert people that there is an electrical storm in the area.
- Consider installing a lightning protection system that is capable of intercepting a lightning strike and conducting it to ground.
- Install lightning arrestors on incoming telephone and power lines to protect against electrical surges generated by lightning.
- Install surge protectors to protect electronic equipment from electrical surges generated by lightning.
- Educate people about the hazards of lightning and stray extraneous electrical current flows.
- Have people trained to administer CPR if someone is hit by lightning.

Emergency Response: During Lightning Storms

- When the storm approaches, it becomes a personal threat to anyone outside the lightning-protected area. Seek shelter in a substantial building. Avoid metal-roofed buildings.
- Discontinue any wet operations where people come in contact with wet or highly conductive environments.
- If you are caught outside, avoid high areas. Do not stand near open water, metal fences, wire or other horizontal conductors. Do not stand near trees, poles, flagpoles or other vertical conductors. Put down metal tools, golf clubs or poles.
- If during the storm your hair stands on end, drop to your knees, bend forward and place your hands on your knees. Do not lie flat on the ground.
- If someone is hit by lightning and loses consciousness, start CPR. Once consciousness is regained, seek medical help immediately. Anyone who is stunned by lightning, even if consciousness is not lost, should also seek medical help.

Emergency Recovery: After Lightning Storms

- Check the area for fires and/or electrical damage that may have occurred.
- Inspect the lightning arrest system for any damage that may have occurred from a direct lightning hit. Repair damage.
- Check all main electrical equipment and circuits if a direct hit is suspected and before energizing equipment that was shut down.

Summary

Lightning storms are a seasonal occurrence in Barrington with occasional thundershowers Bringing sporadic lightning strikes. Preparedness is akin to the Fire Departments response to a house fire.

2.2.5 Tornadoes

Definition:

A *tornado* is a violently rotating column of air that makes contact with the ground. If it does not make ground contact, it is called a *funnel cloud*. If it makes contact with water, it is called a *waterspout.* Funnel cloud and waterspout tornadoes may last only a few seconds or they may continue for over an hour.

Tornadoes can occur anywhere in the world, but they are most common in the United States along the Gulf Coast and across a band of states from Texas to Wisconsin. This area has been nicknamed "Tornado Alley." The tornado threat to Rhode Island is considered minimal; however, tornadoes can occur during hurricanes. Tornadoes can develop at any time, but they are most common in late afternoon during April, May and June.

Most tornadoes are associated with thunderstorms and develop in the right rear quadrant of the storm. They are believed to be created when warm, moist air is rapidly lifted upward by a cold front or from hot air rising from daytime heating.

The average tornado produces winds in the range of 150 mph; it typically cuts a path 200 yards wide and travel about nine miles. However, some tornadoes have produced winds with speeds of up to 500 mph. The very strongest tornadoes may cut paths up to several hundred yards wide and may travel for up to 30 miles.

A ***tornado watch*** means that weather conditions are right to produce a tornado in the area.

A ***tornado warning*** means that a tornado has been sighted and may be heading toward your area. Go to safety immediately. When the tornado warning is issued, all employees should move to the designated secure area.

Emergency Preparedness: Before a Tornado

It is not economically feasible to design a structure to withstand the forces of a severe tornado, but certain measures can be taken to prevent some damage and injuries.

- Establish a plan that takes prevention, emergency response and disaster recovery into consideration. Review and update it as needed for tornado readiness.
- Designate an Emergency Coordinator and team. Assign responsibility to specific employees for advance arrangements to initiate the plan.
- Develop a contingency plan to allow for continued business operations.
- Practice periodic tornado drills so everyone knows how to respond if a tornado is approaching.
- Find an interior area in the building that is secure.
- Stay tuned to a local weather station for updated storm information.
- Use spotters with two-way communication to provide a tornado watch and premise information.
- Secure large exterior appendages that could cause major damage if torn free.
- Tie down items that could be blown over in high winds.
- Inside buildings move objects that could become airborne by winds that come inside.
- Close and secure all doors and windows.

Emergency Response: During a Tornado

- If inside, stay in a safe place until the storm has passed.
- If outside, get to a basement, a sturdy building or lie in a ditch or low-lying area.
- If in a vehicle or mobile trailer, *get out* and go to safety.
- Listen to the weather station to obtain updated information.

Emergency Recovery: After a Tornado

- Conduct a roll call.
- Check all damaged areas for injured people.
- Assess the damage.
- Take steps to mitigate further damage.
- Make emergency repairs.
- Document all damage with photographs and descriptions.
- Initiate salvage operations.

Summary

The Town is without the experience of a tornado. FEMA places Barrington outside the designated area for possible tornadoes.

2.2.6 Wildfires

The three principal factors affecting wildfires are topography, fuel and weather. For example, fire travels down slope much more slowly than it travels upslope and ridge tops often mark the end of a wildfire's rapid spread. Also, a fire's rate of spread varies directly with wind velocity. Other hazards may trigger wildfires and wildfires may contribute to other hazards. For example, high winds can result in downed power lines which can start fires.

The forested areas occupy only 6% (469 acres) of the Town. These wooded areas are localized and disbursed into several sections throughout the Town and are mostly designated as Conservation or Open Space.

Wildfires have not been known to occur and are not considered a risk in the Town of Barrington.
The National Interagency Fire Center has rated this area a low to moderate risk.

2.2.7 Dams

The Town has 3 dams to consider for the impact of dam failure. Two are 3 ft. high dams that contain Echo Lake (which is more like a small pond). These have a short open outflow to the Providence River. The other dam opens out into Allin's Cove and the Providence River that would dissipate any risk of water flooding from a collapse. It is next to an apartment complex. However the headwater is lower than the lowest level of the complex.

2.2 Vulnerability

After identifying types of risk, a vulnerability analysis can help to determine the weak points in the community. This assessment examines the vulnerability of the built environment, such as structures, utilities, roads and bridges, as well environmental vulnerability, such as beach areas that can suffer from erosion. Once the geographic areas of risk are identified in the Town, vulnerability can be assessed for the population, property and resource at risk in those areas. Vulnerability indicates what is likely to be damaged by the identified hazards and how sever the damage may be. For example, if an area is determined to be at risk of flooding, vulnerability

estimates for that area could include residential property losses, impacts to the tax base and damages to public infrastructure.

The Town of Barrington has a current population estimated at 16,700. There are approximately 6,000 homes in Barrington. The Barrington Comprehensive Community Plan adopted by the Town Council in 1992 indicates that 53% of Barrington's land is categorized as residential (2,950 acres). Residential is the most dominant land use in Barrington. Barrington's Comprehensive Plan provides a vulnerability analysis of both the Hundred Year flood and the velocity zone (wave action damage). Map 1 "Significant Natural Features" in Barrington shows both the Hundred Year floodplain and the velocity zone. Barrington's vulnerability to flooding and velocity - - storm surge - - is described in the Comprehensive Plan as follows: "The flood plain is that land in Barrington, where there is a 1% chance of being equaled or exceeded by floodwaters, while the velocity zone is the coastal area within the floodplain which would be affected by a wave surge during hurricanes. These zones are both defined by the Federal Emergency Management Agency. They designate areas which present a safety hazard to existing and potential development, but also provide for necessary flood water retention.

Because the floodplain follows a contour of a given elevation, it covers virtually the entire shoreline of Barrington. The exceptions are those areas where there are steep slopes along the water's edge, such as Nayatt Point. While the floodplain covers all of the coastal wetlands and all of the major inland wetlands that are associated with stream systems (which carry storm water), it also goes beyond these areas. One striking example of this is the Bay Spring area in West Barrington; while the wetlands are confined to the land around Allins Cove, because of the area's low elevation, most of the neighborhood seaward of the East Bay Bicycle Path would be covered during a hundred year storm.

The velocity zone also covers much of Barrington's shoreline. This wave surge would travel inland the farthest along the three south facing points - - Rumstick, Adams and Tyler Points and across the wetland area to the west of Barrington Beach. It would also cover all of the Walker Farm – Osamequin Park area lying between County Road and Hundred Acre Cove, the Hundred Acre Cove wetland lying east of Nockum Hill and a major portion of the floodplain along the Palmer River. The velocity zone does cover some areas which are developed, the most prominent examples being along the eastern side of the Adams Point peninsula and all of Tyler Point. There are other smaller areas of development within the velocity zone, specifically in West Barrington and in Hampden Meadows on the north side of the Barrington River. With the exception of these areas, however, the velocity zone along Barrington's shoreline is within areas of undeveloped coastal wetlands.

The identified 100 year flood zone is populated with residential homes and 5 marinas on the East and West sides of Town. The central traffic artery, Rt.114, is also exposed in low lying areas along the Barrington and Palmer Rivers. The Police Station (once at 95 County Rd., next to the Barrington River) was the only critical Public facility subject to flooding hazard. This facility has been relocated to Federal Rd. in 2000 into a new Public Safety Complex with the Fire Dept. and Emergency Management HQ.

Future development along the shoreline with private homes can only continue on a limited basis due to the absence of undeveloped properties. New homes however can only be constructed using State and Federal constraints as to type of construction and placement of living areas above the expected flood level. What is more the case is re-construction of existing homes in the flood

zone. Waterfront properties will continue to be prime locations for the most expensive homes in the Town.

National Flood Insurance Information

Total flood Insurance Policies	Value of Covered Properties	# Policies in V Zone	# Policies in A Zone	# Claims since 1978	# Repetitive losses/ claims
755	$147,389,600	55	466	168	9/24

To address the special hazards of flood and velocity zones, a section of the Barrington Zoning Ordinance applies to construction or other development within these areas. The regulations prohibit reduction in flood storage capacity, as well as storage of materials or equipment which could cause damage under flood conditions. In addition, construction occurring within the velocity zone must take place above mean high tide."

Evacuation of flood prone areas in Barrington needs to be a consideration for both hurricane evacuation and severe flooding due to heavy rain.

The first priority during an emergency is protecting the health and safety of individuals. *Evacuation planning* is one common means of protecting individuals. Evacuation plans will vary depending on the threat and the nature of the emergency. In the event of an approaching hurricane, evacuation could involve entire neighborhoods.
When developing evacuation plans, consider the needs of residents, emergency responders, students and others. Include provisions for Town and School shutdown. Coordinate plans with the local emergency management office and various outside agencies.

For the millions of Americans who have disabilities and for millions of others around the world, surviving a disaster can be the beginning of an even greater struggle. Individuals who have disabilities may require assistance in evacuating a building, uninterrupted electricity to power a respirator, life-sustaining medication, mobility assistance or post-disaster recovery services. Emergency response personnel must be prepared to address the needs of these individuals during an emergency and in the hours and days that follow. Advance planning facilitates quick response to *any* emergency, but it is especially important in reducing the threats to disabled individuals who require assistance *and* to those who are assigned to provide that assistance.

Evacuation *planning* is the key to mitigating the impact of disasters on the disabled and to protect the health and safety of the disabled. The primary components of evacuation planning are defining:

- Roles and responsibilities
- Evacuation routes
- Areas of rescue assistance
- Accessible facilities
- Post- evacuation activities
- Education and training

Shelters

Shelter use in terms of evacuation is not easily predicted because each emergency situation presents a new set of circumstances. Variables include the length of the warning period, official encouragement of the evacuation, public awareness of location and availability of shelters, level of income of the area and the severity of the approaching hazard. Local officials do have some degree of control over the population that seeks public shelters. If evacuees are encouraged to seek safety at the homes of friends or family, hotels/motels, or shelters that are not advertised, usage will be lower than if shelters are opened early and widely advertised. Evacuations that occur late at night tend to put added stress on shelters because of the increased sense of urgency and inability to contact family and friends in order to make alternative arrangements. A smaller period of time between the evacuation notice and the landfall of the storm usually causes grater use of the shelters because of the rapid nature of the evacuation. The number of retirement communities and trailer/mobile home parks in an area affects shelter use because both of these communities are more likely to seek public shelter.

Hurricane evacuation notices should be released eight hours before the predicted landfall of the storm. This gives most residents plenty of time to seek alternatives to riding out the storm in public shelters, minimizing the shelter demand and opening spaces for those really in need.

Table 3 lists both shelter demand and availability. During a weak hurricane it is projected that 1,000 spaces are needed in American Red Cross (ARC) designated shelters. A severe hurricane would require shelter space for additional people. These numbers do allow for some fluctuation in projected shelter needs.

Table 3. Estimated Public Shelter Demand/Capacity

Strength of Storm	Surge Vulnerable Residents	Non-Surge Vulnerable Residents	Mobile Home Residents	Total Shelter Demand	Total ARC Shelter Capacity
Weak	800	150	0	950	3260
Severe	3200	600	0	3800	4500

The location and identity of Barrington's public shelters are shown on Map 2. A description of each of these facilities for shelter with a capacity analysis is provided following the locator map.

2-3 Risk Assessment Matrix

Local government officials developed a Risk Assessment Matrix (Table 4). The matrix summarizes the priority areas at risk from flooding and other hazards.

Table 4. RISK ASSESSMENT and IDENTIFICATION of PRIORITY PROBLEMS IN BARRINGTON

RISK/TYPES OF PROJECTS	LOCATION (PLAT #)	OWNERSHIP	NATURAL HAZARD	PRIMARY PROBLEM	MITIGATION BENEFITS	RISK (Historical H or Potential P)
Latham Park	Latham Ave. Plat 1 Lot 395	Town	Flood Hurricane	Flooding Erosion Nav. Danger	Protection of Property	H
Byway Road	Bay Spring Neighborhood Plat 1 Lot 240	Town Road	Flood Hurricane	Erosion	Protection of Property & Environment	H
Mathewson Road	West Side of Barrington Plat 25 Harbor	Town Road	Flood Hurricane Winter Storm	Flooding	Protection of Property & Environment	H
Barrington Beach	Narragansett Bay - Plat 8	Town	Flooding Hurricane Winter Storm	Flooding Erosion	Protection of Property & Environment	H
Willow Way	Annawamscutt – Plat 3	Town	Flooding Hurricane Winter Storm	Flooding Erosion	Protection of Property & Environment	H
Bourne Lane	Adams Pt. Road – Plat 26	Town	Flooding Hurricane Winter Storm	Flooding Erosion	Protection of Property & Environment	H
Residential Structures & ISDS	Rumstick Point – Plat 11	Private	Flooding & ISDS Failure	Ecological Impact	Protection of Property & Environment	P

2.5 Maps

The University of Rhode Island Environmental Data Center created two Geographic Information System (GIS) maps for Barrington - - one for the areas that were listed on the Risk Assessment Matrix above and the other for critical facilities in Town. The Risk Map shows public infrastructure (dams, bridges, roads) and flood zones.

The critical facilities map shows the Public Safety Building (Fire/Police) and the Sowams Fire Station as well as schools and roads. Utilities and Red Cross Shelters are also shown on this map as are evacuation routes and traffic control points.

The SLOSH and Flood Zones are also shown. The SLOSH Zones delineated by the U. S. Army Corps of Engineers in a Rhode Island hurricane evacuation study cover much of Barrington. SLOSH stands for the Sea, Lake and Overland Surges from Hurricanes and is a computerized model run by the National Hurricane Center (NHC) to estimate storm surge heights resulting from historical, hypothetical or predicted hurricanes by taking into account:

- Pressure
- Size
- Forward speed
- Track
- Winds

Graphical output from the model displays color coded storm surge heights for a particular area in feet above the model's reference level, the National Geodetic Vertical Datum (NGVD), which is the elevation reference for most maps. Graphical data is available at http://meted.ucar.edu/hurrican/chp/slosh.htm. The calculations are applied to a specific locale's shoreline, incorporating the unique bay and river configurations, water depths, bridges, roads and other physical features. If the model is being used to estimate storm surge from a predicted hurricane (as opposed to a hypothetical one), forecast data must be put in the model every six hours over a 72-hour period and updated as new forecasts become available.
The SLOSH model is generally accurate within plus or minus 20 percent. For example, if the model calculates a peak 10 foot storm surge for the event, you can expect the observed peak to range from 8 to 12 feet. The model accounts for astronomical tides (which can add significantly to the water height) by specifying an initial tide level, but does not include rainfall amounts, river flow or wind-driven waves. However, this information is combined with the model results in the final analysis of at-risk-areas to determining which areas will be inundated by the storm surge. Where the hurricane forecast track is inaccurate, SLOSH model results will be inaccurate. **The SLOSH model, therefore, is best used for defining the potential maximum surge for a location.**

2.6 Tables

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Table 5. – BARRINGTON DAMS

PURPOSE	YEAR COMPLETED	DAM LENGTH	DAM HEIGHT	STRUCTURAL HEIGHT	HYDRA HEIGHT	MAX DISCH	MAX STORAGE	NORMAL STORAGE	SURFACE AREA	DRAINAGE AREA

IND. WTR HYDROELEC		100	5	5	3	35	60	55	20	0.5
OTHER	1911	100	10	10	3	67	1.5	1	0.75	1.75

DAM NAME	NATIONAL ID	STATE ID	RIVER/STREAM	NON-FED DAM ON FED PROP	DAM TYPE
ECHO LAKE DAM	R104283	570	MUSSACHUCK CREEK-TR	NO	ROCKFILL
RHODE ISLAND COUNTRY CLUB POND DAM	R104282	592	MUSSACHUCK CREEK	NO	EARTH, MASONRY

DOWNSTREAM HAZARD	EMERGENCY ACTION PLAN	PHASE I INSPECTION	SPILLWAY HEIGHT	SPILLWAY WIDTH	100 YR STORM	SPILLWAY MAX FLOW DEPTH	OUTLET MAX CAPACITY CFS	SIZE
LOW	NR	NO	3	12	60	0.5	0	SMALL
LOW	NR	NO	3	8	240	2	0	SMALL

Data on dams in Barrington was provided by the Rhode Island Emergency Management Agency

Table 6. BRIDGES IN BARRINGTON

#	Bridge Name	City or Town	Route	Crossing
12201	Nayatt	Barrington	Washington Road	Nayatt Pond
12301	Barrington	Barrington	RI 103 & 114 County Road	Barrington River
12401	Warren	Barrington	RI 013 & 114 County Road	Warren River
18201	Central	Barrington	Massasoit Avenue	Barrington River
83701	Barrington River EBBF	Barrington	East Bay Bicycle Facility	Barrington River
83801	Palmer River EBBF	Barrington	East Bay Bicycle Facility	Palmer River

Source: Rhode Island Department of Transportation

Bridges in the Town of Barrington are identified in Table 6. All of the rivers listed are subject to hurricane flooding.

Table 7. CLASSIFICATION OF BARRINGTON ROADS

TYPE	MILES	% OF TOTAL
Principal Arterial	4.93	5.1%
Minor Arterial	7.81	8.0%
Collector	12.25	12.6%
Local	72.09	74.3%

TOTAL	97.08	100%

County Road, a principal arterial, is a heavily traveled north-south route through Barrington. County Road carries over 20,000 vehicles per day and is a crucial link to Providence and other East Bay communities. This is a critical route.

The road system in Barrington was summarized in the Comprehensive Plan and can be described as follows:

Roadway System

According to the Barrington Department of Public Works, the Town has 97.08 miles of roadway. This total, which does not measure separately the divided sections of Wampanoag Trail, is broken down in Table 7 according to the following classifications:

Principal Arterial - - A roadway carrying the major portion of longer distance trips through an area, generally serving the major movement of traffic not served by freeways.

Minor Arterial - - A roadway which forms the network of cross-travel within a community, generally serving shorter length trips and parallel to a principal arterial.

Collector - - An auxiliary or through roadway which serves to collect and distribute traffic between arterials and local roadways.

Local - - A roadway (street) which serves only to provide access to abutting properties.

Section 3.0 – Mitigation

3.1 Mitigation Overview/Strategy

Several mitigation actions can lessen Barrington's vulnerability to natural hazards. Attempting to mitigate or reduce the hazard consequences requires mitigation planning. Mitigation Planning is the process of identifying and implementing policies, procedures and actions to protect a

municipality and to minimize remove or eliminate high-vulnerability risks. Mitigation techniques can include evacuation plans, emergency preparedness and a prevention program.

Barrington is a small community with few old structures and an infrastructure built up since the 1940's. This has left the Town with a limited legacy of vulnerable construction typical of many urban communities. It also has a forward looking governing Body that has kept zoning and Ordinances targeted at upgrading the community. This has paid off with a short list of needed mitigation actions.

The list of potential actions has ranged from placing all utilities underground (with a huge price tag) to maintenance of roadway storm drains along with guidance from RIEMA on appropriate actions. Selection of the final list of actions came from focused discussions of the Team who have intimate knowledge of what is needed for this small community. That not withstanding, there is also planned a public hearing on the proposed plan before being submitted to the Town Council for their approval.

The ranking of the 7 possible projects was accomplished by assessing the reasonable benefit to the maximum number of people and assets affected and the technical feasibility/cost. Mathewson Road as an example is a mile long road that runs along the Barrington and Warren Rivers with tightly packed homes and attendant utilities. The seawall holds the Rivers in check, but is subject to flooding and erosion during a storm. This caused this project to be rated highest due to the net impact of a severe storm.
At the other end of the rating process are lower cost projects but with few homes and lesser infrastructure involved.

The mitigation/prevention program should:

- Remove or eliminate the hazard
- Reduce or limit the amount or size of the hazard
- Segregate the hazard from that which is to be protected
- Reduce the likelihood of a hazard occurring
- Modify the basic characteristics of the hazard
- Control the rate of release of the hazard
- Establish hazard warning and communication procedures
- Conduct training and education

The Mitigation Action Plan lists mitigation opportunities available to the Town. These actions can help guide funding decisions both pre and post disaster. They serve as objectives for the Town and will be implemented according to priority, timeframe and availability of funding. Projects assigned the highest priority were done so on the basis of the highest benefit to the Town in that the highest ranked would provide the highest level of mitigation benefit.

The timeframes for mitigation actions are assigned as follows:

Short-term = 0 - 6 months
Medium- term = 6 – 18 months
Long-term = 5 years

. Mitigation actions have been identified for the following categories:

I Planning and Regulations
II Property Protection, Structural Projects and Maintenance
III Public Information, Outreach and Incentive Programs
IV Emergency Services (protection of critical facilities)
V Post-Disaster Opportunities

3.2 Mitigation Strategies for Risks in Barrington

Types of Mitigation

What is at risk?	Improvement	Enhancing Natural Resources	Planning and Management	Regulatory Change	Preparedness to reduce loss	Education/ Training

Matthewson Rd.	Rebuild sea wall	Erosion control	Town	n/a	Flood warning Evacuation Alternate traffic plan	n/a
Barrington Beach	Sea wall	Erosion control	Town	n/a	Flood warning Evacuation	n/a
Latham Park	Rip rap	Erosion control	Town	n/a	Flood warning Evacuation	n/a
Byway Rd.	Rip rap	Erosion control	Town	n/a	Flood warning Evacuation	n/a
Willow Way	Rip rap	Erosion control	Town	n/a	Flood warning Evacuation	n/a
Residential Structures & ISDS	install public sewer connection	Pollution abatement	Town	local ordinance	Flood warning Evacuation	n/a
Bourne Ln.	Rip rap	Erosion control	Town	n/a	Flood warning Evacuation	n/a

Each of the "Erosion " projects are old construction and are slowly wearing away, thus losing its effectiveness of its original protection intent. A major storm will easily undermine and upend these structures thus causing damage to the property they are intended to protect.

Implementation

What is at risk?	Responsible Person/Agency	Financing Options	Cost	Priority

Matthewson Rd	Town DPW	budget/grants	$2,000,000	high
Barrington Beach	Town DPW	budget/grants	$240,000	high
Latham Park	Town DPW	budget/grants	$80,000	high
Byway Rd.	Town DPW	budget/grants	$40,000	medium
Willow Way	Town DPW	budget/grants	$20,000	medium
Residential Structures & ISDS	Town Council/ Owners	private/budget/ grants	needs study	medium
Bourne Ln.	Town DPW	budget/grants	needs study	low

Each of these projects will require CRMC permit approval. Each of these projects should be initiated immediately to optimize the effectiveness for storm protection. However budget constraints and the availability of grants will control the initiation of these projects.

3.3 Mitigation Action Plan

Each of the five categories of mitigation actions follows with recommendations:

I. PLANNING and REGULATIONS

A. Acquire Open Space

Revise the list of identified open space areas to be acquired and encourage their acquisition (or protection) by the Town or private conservation organizations.

Lead: Conservation Commission, Town Council
Financing options: FEMA grants, land acquisition bonds (state and municipal), land bank and RI DEM
Cost: variable
Time frame: long-term

B. Establish a Wetland/Coastal Velocity Overlay Zone

In 1990 following the work of the Barrington Land Conservation Trust regarding the identification of wetlands in Barrington and their relative need for protection, the Barrington Conservation Commission introduced a proposal for a wetlands protection ordinance. The purpose of the ordinance was to provide for Town regulation over the impacts of development on all wetland areas. As proposed, it would control such matters as setback of structures, vegetation removal, dumping and filling, use of herbicides and pesticides and general impact on the integrity of wetlands.

The present recommendation expands this concept to include areas within the coastal velocity zone as well. These areas include all areas which are either wetland, within the coastal velocity zone, or both.

The proposed overlay would be done as a floating zone, an unmapped district applied to wetlands and the coastal velocity areas, with associated regulations that are put into place when an application for development (or a clear violation) occurs. This floating zone approach is necessary because of the lack of sufficient accuracy regarding the delineation of wetlands and coastal velocity boundaries, as compared to individual property lines. While the coastal velocity zone is a function of elevation, wetland areas would be defined on the basis of soil, hydrology and vegetation.

The ordinance could be administered through a site plan review process, involving a review board composed of representatives from the Conservation Commission,

Planning Board and Town staff. Projects having no impacts on wetlands nor occurring within the coastal velocity zone would be identified as such by the review board, while those projects that do would be reviewed, and potentially modified, according to the standards established in the ordinance.

Lead: Town planner
Other responsible parties: Zoning Board, Planning Board, Conservation Commission
Financing options: Town budget
Cost: Staff time
Timeframe: long-term

II. PROPERTY PROTECTION

A. Remove Hazardous Tree Limbs

Remove dead or dangerous tree limbs and trees near private homes, Town government structures, school facilities and near power lines.

Lead: Utility companies in public right-of-ways and private owners on private property
Other Responsible Parties: Public Works Department, fire chief, utility companies and private owners
Financing Options: Town budget
Cost: $5,000
Timeframe: medium term

B. Develop a Storm Preparedness Plan for Marine Interests

The Town's Harbor Commission in cooperation with CRMC is bringing to completion a Harbor Management Plan. This includes a comprehensive Storm Preparedness Plan for individual boat owners who utilize Town managed moorings and the four commercial Marinas. The HMP is targeted for final Town Council approval in mid-2004; part of the SPP program is underway. Virtually all mooring holders have filed an individual SPP that details specific actions to protect their boats as a storm approaches. Marina interests will also be required to implement a comprehensive plan for their installed structures and boats docked therein. This last part is planned for the summer of 2004 as the new Ordinance is written and adopted.

Lead: Harbor Commission and Town Council
Other Responsible Parties: Harbormaster
Financing Options: Town Budget
Cost: Operating Budget
Timeframe: 2004

C. Regular Tree Trimming Program (Annual)

Work with local utility companies to develop a program for regular tree trimming.

Lead: Public Works Department
Other Responsible Parties: fire chief, local EMA director, RI DOT, RI DEM and local utility companies
Financing Options: Town budget and donations from local utility companies
Cost: regular maintenance cost
Timeframe: short term

III. PUBLIC INFORMATION

A. Signage

Use informational signs at areas of historic flooding showing the 1938 surge elevations along the bay and rivers. These signs could be as simple as a painted blue ring around a telephone pole or a plaque indicating where floodwaters have reached. It is especially important to include inland areas where the risk isn't so obvious.

Lead: Public Works Department
Other Responsible Parties: state floodplain manager and NWS
Financing Options: Town budget
Cost: minimal
Timeframe: medium term

IV. EMERGENCY SERVICES

A. Relocate Police Station

The old police station was located in a floodplain. The facility has been relocated to the new Public Safety Building which is removed from the river's edge.

Lead:
Financing Options: **ACTION**
Cost: **ACCOMPLISHED**

B. Close Endangered Public Space before Storm

Before a major storm, the Police Department and Harbor Master will keep people away from Town beach and parking lot as well as nearby access roads and mooring areas.

Lead: Police Department
Other Responsible Parties: Public Works Department, fire chief, local EMA director
Financing Options: Town budget

Cost: staff time
Timeframe: short term

V. POST DISASTER OPPORTUNITIES

A. Debris Management

Establish plans for debris removal and disposal to include chipping of wood at disposal site. A separate area must be assigned for hazardous objects (such as propane tanks) that may be mixed in with other debris.

Lead: Public Works Department
Other Responsible Parties: RI DOT, RI DEM and local utility companies
Financing Options: Town budget
Cost: regular maintenance cost
Timeframe: depends on storm activity

B. Coastal Damage Assessment and Recovery

The Harbor Management Plan defines the role of the Harbormaster to lead the effort for post-storm damage assessment along the waterfront. He/she will assist in recovery of locally moored boats and marine related interests to open the waterways for public use,

Lead: Harbor Commission, Town Council to adopt the Harbor Management Plan in 2004.
Other: Harbormaster
Financing Options: Town Budget
Cost: regular budget
Timeframe: post-storm

Section 4.0 Implementation, Evaluation and Review

"The success of the hazard mitigation plan is measured by the degree to which the actions are accomplished. Without the implantation and maintenance of the plan, the previous components have been merely been an effort in research void of any practical application."
--Tennessee Emergency Management Agency

Implementation

In order to establish the authority and accountability for implementation, Barrington needs to maintain the theme of natural hazard mitigation in its Comprehensive Plan. The second step is to continue to implement actions that enable preventive or protective measures to be accomplished. The third step is to prioritize the recommended actions based on the criteria the community established. Barrington is now acting on maintaining sufficient resources to carry out these recommended actions.

In addition, the Town Council will, through approval of this Plan, direct the Planning Board, Zoning Board, Conservation Commission and the Harbor Commission to incorporate Hazard Mitigation issues into future actions recommended for adoption by the Town Council.

Evaluation/Monitoring

The LHMC and other Public Officials plan to meet every six months to ensure that the mitigation actions are being implemented in accordance with the assigned time frames. Notice of these meetings will be publicly posted and be open to the public. The Town Manager will monitor the actions of the LHMC and insure minutes of such meetings are recorded with the Town Clerk.

Revision

The LHMC will also meet after a disaster to evaluate and document the Town's performance relative to the event. The local strategy will be updated once a year by the LHMA. The update should be reviewed and submitted to RIEMA upon local approval to ensure that the Town's hazard mitigation strategy remains current and formally updated every five years to FEMA.

Section 5.0 Adoption

Appendix

Barrington Repetitive Loss Properties

Comm. Nbr.	Prop Loc	Insured	Address	Owner
445392	0096693	Yes	2 County Rd	

445392	0032041	No	509 County Rd	W.F. & I.P Wilson
445392	0088076	No	81 County Rd	
445392	016370	Yes	38 Mathewson Rd	ITS Succ./Assgn.
445392	0035227	No	6 Nathaniel Rd	
445392	0032033	No	12 Willow Way	
445392	0056368	Yes	12 Willow Way	
445392	0016398	Yes	1741 Wampanoag Tr.	